A Project Report

on

CONVERSATIONAL BOT

Submitted in partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF TECHNOLOGY

in

INFORMATION TECHNOLOGY

by

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Bachupally, Hyderabad – 500090

April 2

DECLARATION

We hereby declare that the work presented in this project entitled **"CONVERSATIONAL BOT"**submitted towards completion of the major project in IV year of B.Tech IT at "BVRIT HYDERABAD COLLEGE OF ENGINEERING FOR WOMEN**"**, is an authentic record of our original work carried out under the esteem guidance of Ms.N.Pujitha, Assistant Professor, IT department.

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Certificate

This is to certify that the Project report on **"Conversational Bot"** is a bonafide work carried out by **D.Preethika(16WH1A1212), M.Sriya(16WH1A1244), Naushin Azi(16WH1A1249)** in the partial fulfillment for the award of B.Tech degree in **Information Technology, BVRIT HYDERABAD COLLEGE OF ENGINEERING FOR WOMEN, Bachupally, Hyderabad**, affiliated to Jawaharlal Nehru Technological University, Hyderabad under my guidance and supervision.

The results embodied in the project work have not been submitted to any other University or Institute for the award of any degree or diploma.

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Finally, We would also like to thank our project co-coordinator, all the faculty and staff of IT Department who helped us directly or indirectly, parents and friends for their cooperation in completing the project work.

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ABSTRACT

Chatbots, or conversational interfaces as they are also known, present a new way for individuals to interact with computer systems. Traditionally, to get a question answered by a software program involved using a search engine, or filling out a form. A chatbot allows a user to simply ask questions in the same manner that they would address a human. The most well known chatbots currently are voice chatbots: Alexa and Siri. However, chatbots are currently being adopted sat a high rate on computer chat platforms.The technology at the core of the rise of the chatbot is natural language processing ("NLP"). Recent advances in machine learning have greatly improved the accuracy and effectiveness of natural language processing, making chatbots a viable option for many organizations. This improvement in NLP is firing a great deal of additional research which should lead to continued improvement in the effectiveness of chatbots in the years to come. People are using messaging applications these days such as Facebook Messenger, Skype, Viber, Telegram, Slack etc. This is making other businesses available on messaging platforms leads to proactive interaction with users about their products. To interact on such messaging platforms with many users, the businesses can write a computer program that can converse like a human which is called a chatbot.

LIST OF FIGURES

LIST OF ABBREVATIONS

Word	**Abbrebvation**
Machine Learning	ML
Hyper Text Markup Language	HTML
Hypertext Preprocessor	PHP
Application program interface	API
Cascading Style Sheets	CSS

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1. INTRODUCTION

1.1 OBJECTIVE

In this technology world, a recent technology called chatbot which have been in demand and usage for every business purpose and have hit the market.Chatbots is an interaction between person and bot which gives us a efficient service and it also gives the way to develop customer engagement and efficiency by reduction of cost by using these service Chatbots can be accessible at anytime ,which can handle capacity that is chatbot can chat with thousands of people at a time ,It has a flexible attributeas well as customer satisfaction.A chatbot is constructed using natural language processing with the help of machine learning algorithm for training the bot and to make up the bot to perform in a right way and so training and testing is done using ML.Our Main Objective is to build a chatbot for our college website which will help many new students to know about the college in detail.

1.2 PROBLEM IN EXISTING SYSTEM

Chatbots are used as messaging service provider which provides instant messaging framework .Its goal is to provide conversational service to the people who interact with bots normally called as user in an efficient way.Now-a-days people are more interested in the website which would provide the information easily to them. Many students who have just completed their Intermediate education would be in search of the Colleges. In the existing system, there is no provision of the chatbot.

1.3 SOLUTION

We are providing a Chatbot which will help the students or any other users to get the information required for them easily.Some people may not feel comfortable to talk with the Office staff such people can talk with the bot and get the information required for them.

1.4 FEATURES

Chatbots are replacing some of the jobs that are traditionally performed by human workers, such as online customer service agents and educators.These Chatbot provide the information related to our college. It displays the responses based on the questions asked.There are many types of chatbots our chatbot retrives the information and then replies for the questions asked This chatbot is basically a retrieval based chatbot.

2. LITERATURE SURVEY

2.1 CHATBOT TAXONMY

Chatbots can be divided into groups, depending on topics like complexity, usage or privacy. The taxonomy divides chatbots into three groups:

- rule-based chatbots
- retrieval-based chatbots
- generative-based chatbots.

2.1.1 RULE-BASED CHATBOTS

The **rule-based chatbots** rely on a list of questions and corresponding answers. It can be a loose list of questions or a simple scenario with such questions where the user is asked questions one by one until the chatbot get all information needed to return a valuable response. It could be a flight booking chatbots asking about the departure date, destination and departure locations. After the response, the chatbot can ask more to filter the best fit like the number of stops, time of departure or arrival and so on. It is simple and we don’t need to use any machine learning methods and in most cases also no natural language processing is needed. We can easily rely on regular expressions or in more advanced cases use string distance metrics that can surprisingly give good results in many cases.

2.1.2 RETRIEVAL-BASED CHATBOTS

Retrieval-based chatbots rely on machine learning and word vectorization. Words are vectorized, because machine learning methods use numbers for prediction. There are several methods that can be used for vectorization. The result of vectorization allows putting each word in a feature space. In many cases, the vector consists of more values. In Spacy the vector for the most popular model is the size of 384. It can be reduced to a two- or three-dimensional space with t-SNE or similar methods. An example of a few words in a three-dimensional space is given in figure 1. We can easily apply mathematical operations to manipulate the data. Each word that is represented as a vector can next be used to train a model. In the case of retrieval-based chatbots, we train intent prediction. It means that we are able to discover users’ intent and based on that we can build scenarios of a conversation.

When it comes to machine learning methods, there is no one method that gives the best results and we should check several and compare which one gives the best results.

2.1.3 GENERATIVE-BASED CHATBOTS

Generative-based chatbots are the most complex compared to the two previous approaches. It’s more generic, but the training requires a much bigger data set. This fact is in many cases a limitation for many companies. They cannot afford to get a big data set of examples for training. Generative-based chatbots **use deep learning methods for training**. If done properly, generative-based chatbots give impressive results.

2.2 CHATBOT CONVERSATION FRAMEWORK

This framework is built by looking at if the questions asked to the Chatbot are restricted in scope then how the Chatbot generates a response to those questions.

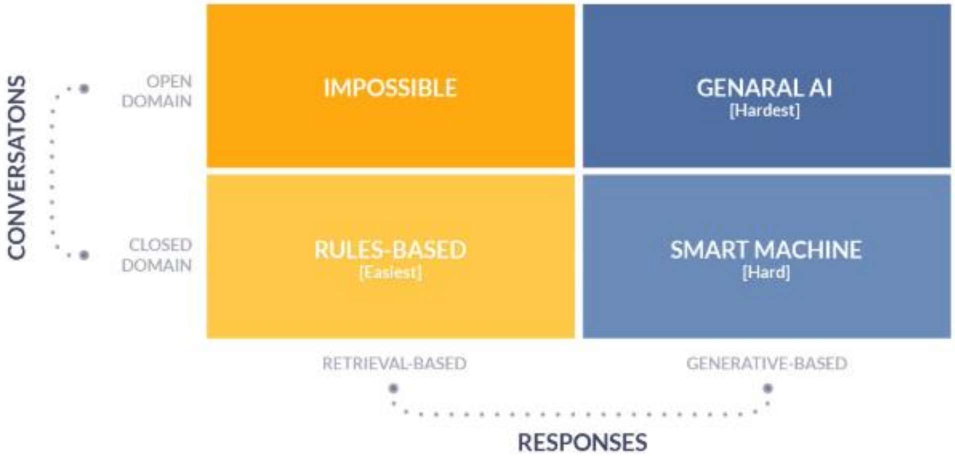


FIG-1 CHATBOT CONVERSATION FRAMEWORK

2.2.1 CONVERSATIONS

2.2.1.1 OPEN DOMAIN

Open domain is the place where the chat conversation can go anywhere, users can type/ask anything.There isn’t necessarily have a well-defined goal or intention.the conversation can go into all kinds of directions. The infinite number of topics and the fact that a certain amount of world knowledge is required to create reasonable responses makes this a hard problem. I can ask a question about any topicand expect a relevant response.

2.2.1.2 CLOSED DOMAIN

Closed domain is the place where you are solving a particular business problem.closed domain bots focus on one particular sector or industry.The closed domain bots have the limited functionalities/ services based on the business problem.You can ask a limited set of questions on specific topics.

2.2.2 RESPONSES

2.2.2.1 RETREVAL BASED

The Chatbot uses a repository of pre-defined responses from which to pick an answer. Such repository can be an FAQ or KM or other source that houses the response. Picking the best answer can range from rule-based selection to use of smart machine technology. One important point is retrieval systems are not generating new text to provide answers.

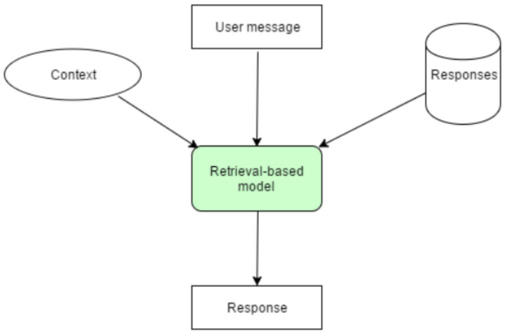


FIG-2 RETREVAL BASED

2.2.2.2 GENERATIVE BASED

The Chatbot does not use a pre-defined response but rather generates responses from scratch. Only smart machines are capable of generating responses from scratch.don’t rely on pre-defined responses. They generate new responses from scratch. Generative models are typically based on Machine Translation techniques, but instead of translating from one language to another, we “translate” from an input to an output

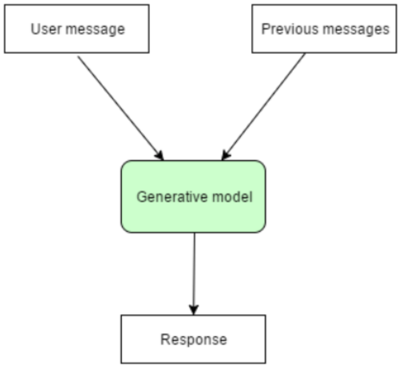


FIG-3 GENERATIVE BASED

Closed Domain Question with Retrieval Responses:

As it is a closed domain we ask the questions related to the specified topic and it is retrieval based responses so for any specifically asked question there will be an answer. It is easier to achieve we just need to select specific topic and build a conversation on that topic.

Closed Domain Question with Generative Responses:

Inthis questions are asked and the Chatbot has smart machine technology that generates responses.Generated responses allow the Chatbot to handle both the common questions and some unforeseen cases for which there are no predefined responses. The smart machine can handle longer conversations and appear to be more human-like. But generative response increases complexity, often by a lot.

Open Domain Question with Generative Responses:

In this, we get to ask any question and expect a response. This is AGI. Artificial general intelligence(AGI) is the intelligence of a smart machine that could successfully perform any intellectual task that a human being can. A lot of money and research is being poured into this area but we are a long way off from achieving anything we can operationalize in our business.

Open Domain Question with Retrieval Responses:

This will not work because responses cannot be defined for any question. It is a no-go. It is impossible.

We provide this framework as a starting place to explore how you can use chatbots and smart machines in your customer service environment. Remember this is a starting place and the lines will get burred by things like hybrid smart machines.

3 REQUIREMENT SPECIFICATIONS

Software requirements deal with software and hardware deals with resources that need to be installed on a serve which provides optimal functioning for the application. These software and hardware requirements need to be installed before the packages are installed. These are the most common set of requirements defined by any operation system. These software and hardware requirements provide compatible support to the operation system in developing an application.

3.1.1 SOFTWARE REQUIREMENTS

The software requirements specify the use of all required software products like data management system. The required software product specifies the numbers and versions. Each interface specifies the purpose of the interfacing software as related to this software product.

➢ Operating system	:	Windows 7/10
➢ Coding Language	:	PHP,PYTHON,MYSQL,HTML,CSS
➢ IDE	:	XAMPP

3.1.2. HARDWARE REQUIREMENTS

The hardware requirement specifies each interface of the software elements and the hardware elements of the system. These hardware requirements include configuration characteristics.

➢ System	: Pentium IV 2.4 GHz.
➢ Hard Disk	: 100 GB.
➢ Monitor	: 15 VGA Color.
➢ RAM	: 2 GB.

4 DESIGN OF THE SYSTEM

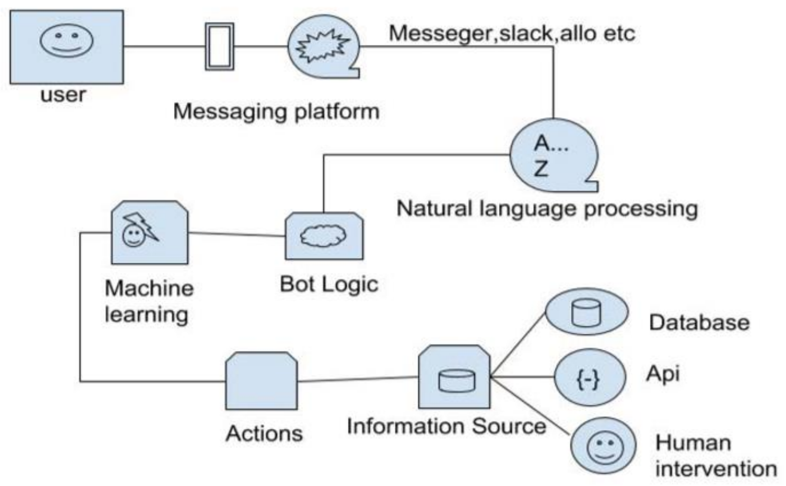


FIG-4 ARCHITECTURE OF CHATBOT

In fig-4 Overall process behind the chatbot is shown when any user enters some text in the messaging platform then the input is taken to the natural language processing here the bot searches for the required pattern and then it moves to the machine learning algorithm after that when it finds the required pattern then it process the data based on the given actions and takes the responces from either database or from api or with human intervention it gives the responses to the user

In our project we are using retrieval based model in which the response for the project are previous stored in the database when the user gives any text as an input then the chatbot searches for the pattern in the database and retrives the response and then gives the response to the user.For every question we have to think the different ways in which the user can ask the questions and then give the response based on it

The chatbot can have separate response generation and response selection modules, as shown in the diagram below.

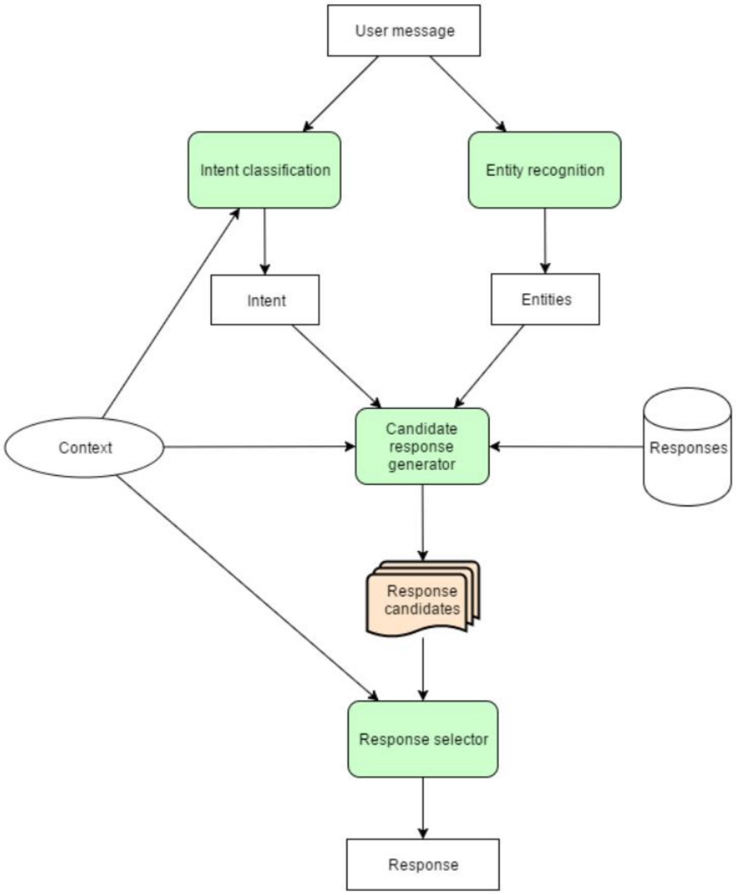


FIG-5 FLOW CHART OF CHATBOT

Message processing begins from understanding what the user is talking about. Intent classification module identifies the intent of user message. Typically it is selection of one out of a number of predefined intents, though more sophisticated bots can identify multiple intents from one message. Intent classification can use context information, such as intents of previous messages, user profile, and preferences. Entity recognition module extracts structured bits of information from the message. The weather bot can extract location and date.

The candidate response generator is doing all the domain-specific calculations to process the user request. It can use different algorithms, call a few external APIs, or even ask a human to help with response generation. The result of these calculations is a list of response candidates. All these responses should be correct according to domain-specific logic, it can't be just tons of random responses. The response generator must use the context of the conversation as well as intent and entities extracted from the last user message, otherwise, it can't support multi-message conversations.

The response selector just scores all the response candidate and selects a response which should work better for the user.

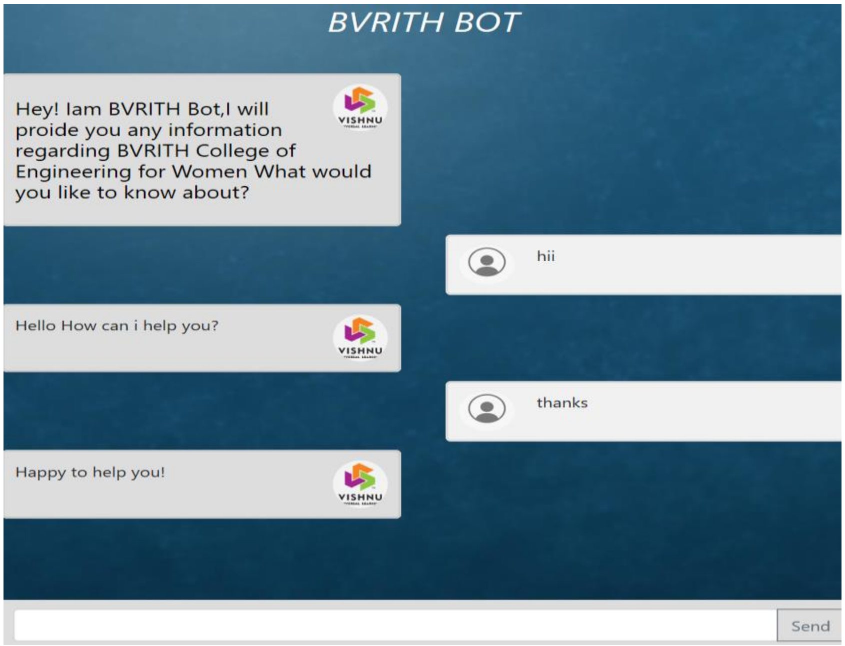
5.MODULES

➢ User Module

A chatbot is primarily built to serve the user request.In the user module the chatbot gets the input from the user an then gives the response based on it.

➢ Bot Module

It is crucial for the chatbot to plan how to perform the task requested by a user. Chatbot responds to each user request by learning from the conversation so as to what the request is. Progress from one user request to another also requires planning until completion of the task. When it comes to complex tasks, chatbots must identify the action sequence to do the primary goal of the user. Planning is a sequence of actions which form conversations and include acknowledgment, questions, and information. As it learns from conversations with the users it will continue growing smarter and smarter with each conversation.



BVRITH BOT

Hey! Iam BVRITH Bot,I will proide you any information regarding BVRITH College of Engineering for Women What would you like to know about?

hii

Hello How can i help you?

thanks

Happy to help you!

FIG-6 SAMPLE CONVERSATION

6. IMPLEMENTATION

Implementation in software development is the process of realizing an application's requirements and design. It mainly involves mapping the design into coding in order to achieve the specifications stated for the application. This section will describe the key implementation processes and some code snippets of this chatbot(College Bot). This application was implemented as a PHP,Python and HTML thus, the database tables used by the application were automatically generated by XAMP. the application was structured according to the chatbot pattern. This pattern aims to separate the user interface logic from the business logic. Also, this pattern helps to create well defined and organized chatbot with efficient code reuse and multiple ways of interacting.

HTML

HTML, a initial of Hypertext Mark up Language, is the predominant mark up language for web pages. It provides a means to describe the structure of text-based information in a document by denoting certain text as headings, paragraphs, lists, and so on and to supplement that text with interactive forms, embedded images, and other objects. HTML is written in the form of labels (known as tags), surrounded by angle brackets. HTML can also describe, to some degree, the appearance and semantics of a document, and can include embedded scripting language code which can affect the behaviour of web browsers and other HTML processors.

The idea behind Hypertext is that instead of reading text in rigid linear structure, we can easily jump from one point to another point. We can navigate through the information based on our interest and preference. Hyperlinks are underlined or emphasized works that load to other documents or some portions of the same document.

HTML can be used to display any type of document on the host computer, which can begeographically at a different location. It is a versatile language and can be used on any platform or desktop

SQL

- Structured Query Language (SQL) is the language used to manipulate relational databases.
- SQL is tied very closely with the relational model.
- In the relational model, data is stored in structures called relations or tables. SQL statements are issued for the purpose of:
- Data definition: Defining tables and structures in the database (DDL used to create, alter and drop schema objects such as tables and indexes).
- Data manipulation: Used to manipulate the data within those schema objects (DML Inserting, Updating, Deleting the data, and Querying the Database).
- A schema is a collection of database objects that can include: tables, views,indexes and sequences.

List of SQL statements that can be issued against an Oracle database schema are

- ALTER - Change an existing table, view or index definition (DDL)
- AUDIT - Track the changes made to a table (DDL)
- COMMENT - Add a comment to a table or column in a table (DDL)
- COMMIT - Make all recent changes permanent (DML - transactional)
- CREATE - Create new database objects such as tables or views (DDL)
- DELETE - Delete rows from a database table (DML)
- DROP - Drop a database object such as a table, view or index (DDL)
- GRANT - Allow another user to access database objects such as tables (DDL)
- INSERT - Insert new data into a database table (DML)
- NO AUDIT - Turn off the auditing function (DDL)
- REVOKE - Disallow a user access to database objects such as views (DDL)
- ROLLBACK - Undo any recent changes to the database (DML - Transactional)
- SELECT - Retrieve data from a database table (DML)
- TRUNCATE - Delete all rows from a database table (DML)

- UPDATE - Change the values of some data items in a DataBase Table(DML).

XAMPP SERVER

It is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages.Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server possible.

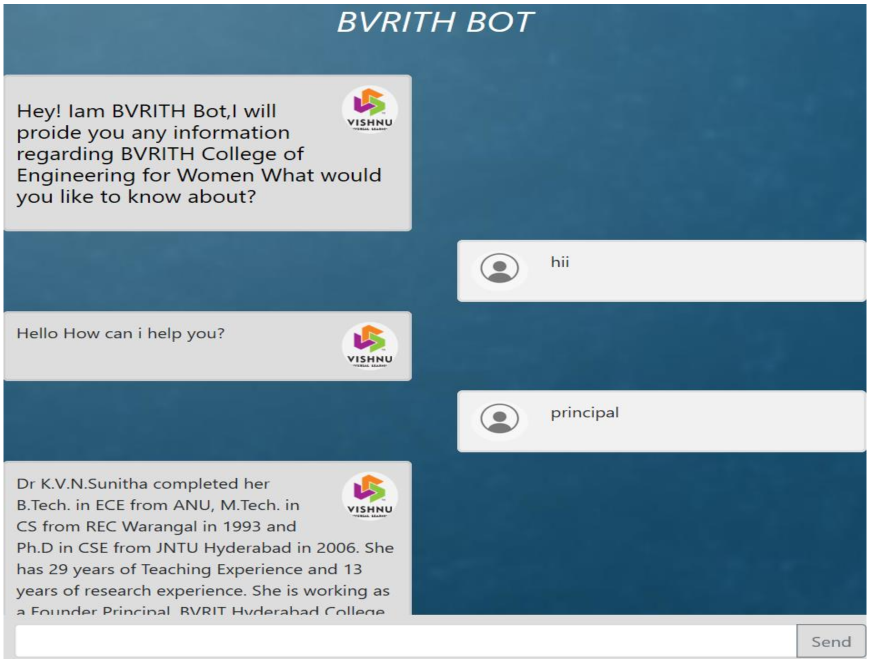
XAMPP's ease of deployment means a WAMP or LAMP stack can be installed quickly and simply on an operating system by a developer. With the advantage of common add- in applications such as WordPress and Joomla! can also be installed with similar ease using Bitnami.

PHP

PHP is an HTML-embedded, server-side scripting language designed for web development. It is also used as a general-purpose programming language. It was created by Rasmus Lerdorf in 1994 and appeared in the market in 1995. Much of its syntax is borrowed from C, C++, and Java.

PHP codes are simply mixed with HTML codes and can be used in combination with various web frameworks. Its scripts are executed on the server. PHP code is processed by a PHP interpreter. The main goal of PHP is to allow web developer to create dynamically generated pages quickly.

A PHP file consists of texts, HTML tags and scripts with a file extension of .php, .php3, or .phtml. You can create a login page, design a form, create forums, dynamic and static websites and many more with PHP.



Hey! Iam BVRITH Bot,I will proide you any information regarding BVRITH College of Engineering for Women What would you like to know about?

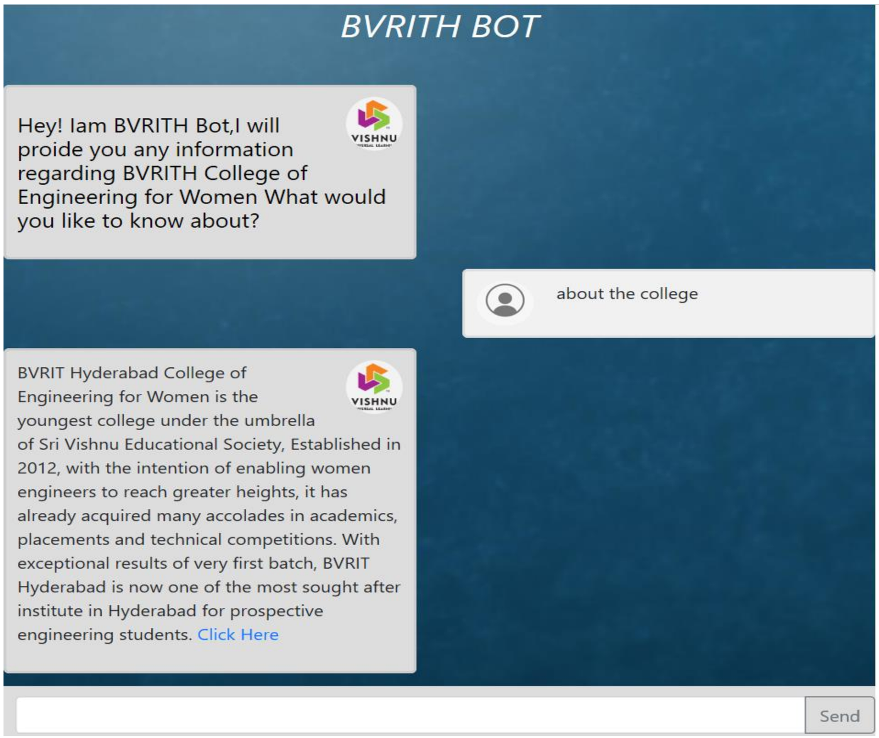
hii

Hello How can i help you?

principal

Dr K.V.N.Sunitha completed her B.Tech. in ECE from ANU, M.Tech. in CS from REC Warangal in 1993 and Ph.D in CSE from JNTU Hyderabad in 2006. She has 29 years of Teaching Experience and 13 years of research experience. She is working as a Founder Principal, BVRIT Hyderabad College

FIG-7 IMPLEMENTATION -1



Hey! Iam BVRITH Bot,I will proide you any information regarding BVRITH College of Engineering for Women What would you like to know about?

about the college

BVRIT Hyderabad College of Engineering for Women is the youngest college under the umbrella of Sri Vishnu Educational Society, Established in 2012, with the intention of enabling women engineers to reach greater heights, it has already acquired many accolades in academics, placements and technical competitions. With exceptional results of very first batch, BVRIT Hyderabad is now one of the most sought after institute in Hyderabad for prospective engineering students. Click Here

FIG-8 IMPLEMENTATION -2

7.TESTING

Chatbots are driven by natural language processing, including both auditory and text designed conversations to perform a pre-defined task. The challenge in building a chatbot is not as much technical but more an issue of user experience. So, the most successful bots will be the ones that provide consistent value to user’s requirement.

Chatbot testing is a critical enabler in the success of an effective and efficient chatbot, where we as testers actually analyse if all the required features are correctly incorporated into the bot and if it is responding appropriately to the user queries. However, the chatbot testing is quite different to traditional software application testing. Unlike other web and mobile applications where application runs in a predefined way of interaction, the chatbot applications run without any restriction. As a result, chatbot should be developed and tested with all unexpected scenarios.

Chatbot testing can be divided into the following four areas.

1.Conversation Design Testing

2. Entities Testing

3. Fulfilment Testing

4. User Acceptance Testing (UAT)

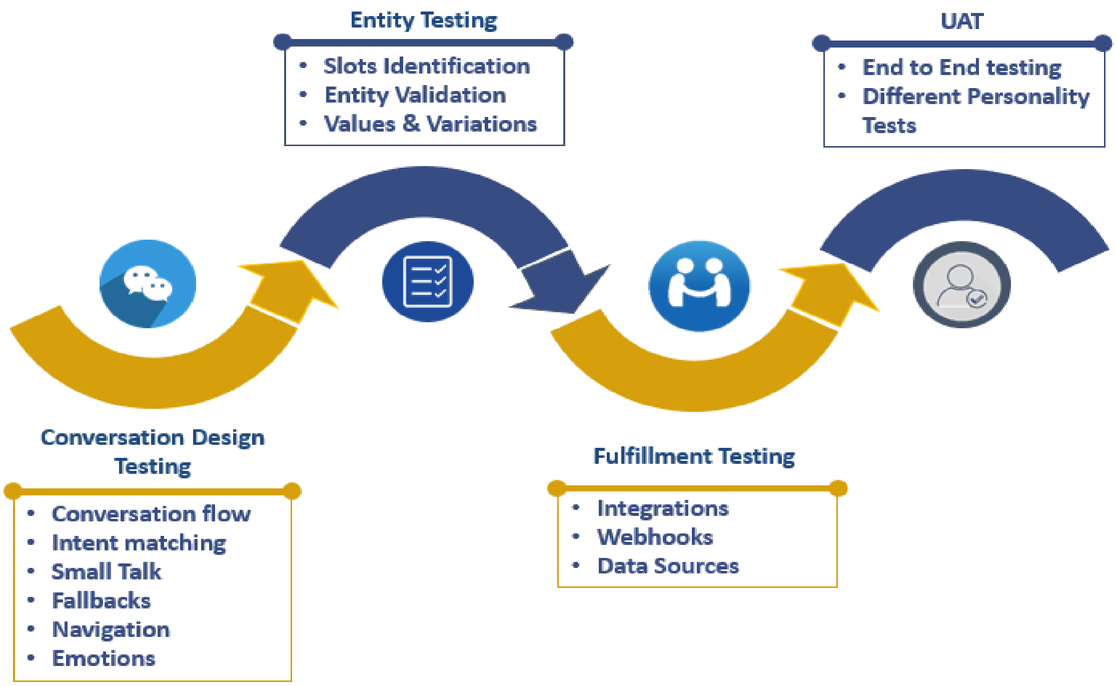


FIG -9 DIFFERENT AREAS OF TESTING

1. Conversation Design Testing

Natural language understanding tools illustrate user's inputs, bot's responses and calls to external sources, allowing us to have an overview of the whole conversation. NLP extracts both the intent and entity from user's input and provides a precise response to the user.

From testing perspective Conversation Design testing has the following key areas:

1.1 Conversation Flow

Technically conversation is a process where two speakers exchange communications between themselves through meaningful sentences. This back and forth exchange of words is also known as dialogs. As Chatbots are also based on a similar concept of conversations, therefore, testing conversational flow is an essential step in chatbot testing.

We can test the conversation flow by adding happy path scenarios (usual talks) and negative path scenarios (unexpected talks) to the conversation flow. Also, we can add “Yes” (approval) and “No” (denial) expression to test bot’s behaviour. An appropriate conversation flow should talk tactfully and keep the user engaged with relevant replies while maintaining a balance between the message length and its meaning.

1.2 Intents matching, Training phrases, and responses

Intents are the goals or the purpose of the user’s input, or we can call it is a “collection of sentences.” The chatbot typically has multiple intents, which we create to define the scope of the application. To understand this in a better way, we can consider a simple example of “Ordering a coffee.” we can give the order to the bot to “make a coffee,” and we expect an order confirmation. So, we can test this scenario by adding more matching intent or training phrases and see if the bot can clearly understand user’s input.

1.3 Small talk

Small talks are basically a casual conversation between user and the bot. We could perform this aspect of testing by adding more and more small casual talks, and subsequently, we need to compare the responses with the bots reply to these talks. A collection of Small talks can greatly improve user’s experience when talking to the bot. Small talk makes the bot more conversational by having responses for casual conversation topics like greetings or jokes, etc. instead of redirecting the user to a fallback response.

1.4 Fallback

Fallback is a process to measure the response of bot on unmatched inputs. Chatbots we are also expecting the same human language response from a bot. We can test these scenarios by writing appropriate test cases to make chatbot fallback.

1.5 Navigation

In a conversational interface there are no options like back buttons or a search box to help users go from some parts of the interaction to others. However, users have the same needs they used to have traditional interfaces; they change their mind and want to go back, they want to skip steps, etc. We need to test such navigational scenarios in our testing to make the bot understand and deal with such needs appropriately.

1.6 Emotions

Emotion is tone of the language which includes anger, fear, joy, sadness, and disgust. Some of the chatbot platforms are using this in their chatbot messenger to understand the emotions of user's mood and processes text messages into the chat window. Test cases need to be written to understand the emotions and respond appropriately to user emotions.

2. Entities/ Slot

An entity is a keyword extracted from a Training phrase. When the user speaks or types, Chatbot will look for value of the various entities it needs from the context of the conversation. We use entities to automatically extract the information from what the user says. Testing need to cover all entities, it’s value and variations as well as assertions.

3. Fulfilment

Once the requirement from the user (along with the entity values to be sent with the request) has been received; the bot needs to request the information to fulfil the user’s request. Now, this data is to be sent to web-hook so that the required information can be fetched. Once the web-hook has fetched the required information, it will send the response back to the user in the desired manner. The response is the content which will be delivered to the user once the request for fulfilment has completed. Fulfilment testing should cover all integration points as well as data sources.

4. UAT

The importance of assuring the quality of chatbot is very important. So, the main priority is to test that the chatbot functionality is as per requirements and goals. It is very important that user testing is done on a chatbot before releasing it to the market. Also, it is very important to test the chatbot with different users and people with different personalities.

UAT should be carried out after full implementation of the bot is complete including integration of intents, entities, Smalltalk, fallback, and fulfilment.

8.CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION

Chatbots won't be limited to the messenger window. The architecture mentioned above can be generalized for all systems of interaction. In the end, it is about using language to understand the construct of the world. Forms of language will change as time progresses, from text to emojis[35] to neuralink, but what will remain constant is the representations of the world in our mind and our need to convey our thoughts. Bots are the beginning of an interface between humans and artificial general intelligence. The architecture and the tools we surveyed help one have an idea of the kind of bot to be built for their system, what to expect from the bot and what tools to use to build it. We also hope that this provides a direction for further possible innovations and research areas in text based conversational interfaces.

8.2 FUTURE SCOPE

Looking at the current explosion of chatbots, one might think that the chatbots have succeeded and we have agents that converse like human beings. Yet using general chatbots turns out to be disappointing since they do not do what the users expect them to do. However, on the other hand, narrow ones do very well. The reason why chatbots are disappointing are because our expectations are hyped about what they can do. We expect the agents to be able to respond to anything without understanding that the agent's job is to respond to relevant queries. Humans wouldn't be any better either if you asked a salesman what is the height of the tallest mountain. We do aim to make artificial general intelligence yes. But that wouldn't require that every bot made in the journey imitates it. As long as the bot does the task it is designed to simplify, it should be satisfying.

However even with the expectations adjusted, it is difficult to convey the command when the command contains a deep query such as "Message Lisa reminding about the thing in my last note" or even continuity of conversation. It is difficult for bots to get these kind of constructs, machine learning helps extract entities and label parts however, this requires training them on domain specific data and for many domains, tons of labeled data is hard to come by. Without artificial intelligence truly powering the bots, the bots become the text version of a telephonic service line which says "press 1 for menu, press 2 for complaint booking." but more naturally and on text. However primitive, they do provide the same benefit of being present where the user is and use up resources of the user. It reduces the number of steps required and makes the service more accessible. We hence next describe various challenges that still stand in the way of natural language understanding and generation. They are general checkpoints we would want the systems to perform in order for the systems to feel natural.

A. **Context Awareness:** Conversational agents are not context aware as of now. If a user says "Text Jason and tell him that the time of the evening event is shifted to 7 p.m." The agent should be able to check the calendar for events and predict or ask about which event the user is talking about. Secondly, if the user says "I would like to order a black coffee in size medium" and then says " Change that to large" the agent should be able to recognize which factor must be changed.

B. **Diversity of responses**: Agents as of now lack diversity when they are rule based or when they are trained to extract from a certain set of responses. Generative algorithms that can generate diverse responses based on the situation after learning from a set of prebuilt responses while maintaining the meaning of the response could be worked upon.

C. **Intention driven responses**: Generating responses based on the intention would give way to more diverse responses and would reduce the need for domain specific training data. Since, responses are not built based on training data rather, they are built on events. The bot is aware of the information it has to convey and it conveys the information using dynamically generated response.

D. **Personality[34]:** As conversational agents proliferate, we will want them to be more human. One aspect of humanizing the bots will be adding personality to them. Pre - trained models respond according to the responses it is trained on. For a personality, all the responses in the training set would have to be entered in accordance to the personality. Doing so would be tedious. Hence, methods for generating responses in accordance with a given set of characteristics would help make the bots more human.

E. **User Awareness**: The conversational agents, especially the intrapersonal bots, would need to be aware of their users. They will need to remember who the user is and what the user is preference is. It might be easy to integrate preference in the bot when the bot is connected or has access to the user's social media profile but it will be difficult to do so based on only conversational information. Research is needed in extracting user persona based on user conversations and embedding the information about the user in the bot's replies. Not only would this make the bot more human but it would make the user feel affiliated to the bot on a personal level.

F. **Continuity of conversation**: For virtual assistants that aim to be friends or companions of the user, the bot should be able to converse when the user continues conversations that the user left midway. For example, if the user had been talking about an item and then says "Do you remember that mug I was talking about that had a blue handle?" the bot should be able to recall all other associated properties of the mug the user had mentioned.

G. **Narration**: The bot should be able to narrate the sequence of events as they occurred. For example, if the user placed an order with a site and then I ask my bot to cancel it, the bot should be able to narrate its own actions. Or, if the user asks the bot about the events of today, the bot should be able to link all the events together and narrate them sequentially. As bots get more personal, we would also want them to recall stories that another family member told them and narrate them back to us.

9. REFERENCES

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